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An automatic approach for rice mapping in temperate region using time series of MODIS imagery: first results for Mediterranean environment

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Timely and accurate information on crop typology and status are required to support suitable action to better manage agriculture production and reduce food insecurity. More specifically, regional crop masking and phenological information are important inputs for spatialized crop growth models for yield forecasting systems. Digital cartographic data available at global/regional scale, such as GLC2000, GLOBCOVER or MODIS land cover products (MOD12), are often not adequate for this crop modeling application. For this reason, there is a need to develop and test methods that can provide such information for specific cropsusing automated classification techniques.. In this framework we focused our analysis on the rice cultivation area detection due to the importance of this crop. Rice is a staple food for half of the world's population (FAO 2004). Over 90% of the world's rice is produced and consumed in Asia and the region is home to 70% of the world's poor, most of whom depend on rice for their livelihoods and\or food security.
Several initiatives are being promoted at the international level to provide maps of rice cultivated areas in South and South East Asia using different approaches available in literature for rice mapping in tropical regions. We contribute to these efforts by proposing an automatic method to detect rice cultivated areas in temperate regions exploiting MODIS 8-Day composite of Surface Reflectance at 500m spatial resolution (MOD09A1product). Temperate rice is cultivated worldwide in more than 20 countries covering around 16M ha for a total production of about 65M tons of paddy per year. The proposed method is based on a common approach available in literature that first identifies flood condition that can be related to rice agronomic practice and then checks for vegetation growth. The method presents innovative aspects related both to the flood detection, exploiting Short Wave Infrared spectral information, and to the crop grow monitoring analyzing vegetation index seasonal trend.
Tests conducted in European Mediterranean environment demonstrated that our approach is able to provide accurate rice map (User Accuracy > 80%) when compared to available Corine Land Cover land use map (1:100.000 scale, MMU 25 ha). Map accuracy in term of omission and commission error has been analyzed in north of Italy where about 60 % of total European riceis produced. For this study area thematic cartography at 1:10.000scale allowed to analyze the type of commission errors and evaluate the entity of omission errors in relation to low resolution bias and/or algorithm performance. Pareto boundary method has been used to assess the level of accuracy of the method respect a maximum achievable accuracy with medium resolution MODIS data. Results demonstrate that the proposed approach outperform the method developed for tropical and sub-tropical environment.